

Out of a total of 101 species, twenty-four have a shell-layer of aragonite—

Gasteropoda	10 (inner and only layer).
Lamellibranchiata	10 (inner of two layers).
Cephalopoda	4 (outer of two layers).

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In none of the Cephalopoda recorded above is a third or 'black layer' present, but an example of *Nautilus striatus*, Sow., from the Lias is contained in the same collection possessing this in a very good state of preservation. In *Baculites* an extraordinary thick shell exhibits three distinct layers all of calcite, but the middle one was originally aragonite like other Cephalopods. Of the Cephalopods with an aragonite layer one is a Middle Lias and three are Upper Lias forms. Amongst the Gasteropods which still retain an aragonite layer eight come from the Lower Lias and all but one from the same locality, Old Dalby, whilst two are Coralline Crag species. The proportion of casts in this group is much larger than in Lamellibranchiata or Cephalopoda. There is, moreover, apparently a geographical limit to the persistence of aragonite in the same formation, as illustrated by the Old Dalby species. There is no restriction of it to certain generic types, though it is found most often in the genera *Amberleya*, *Trochus*, *Chemnitzia*, *Cerithium*, and *Turritella*, and amongst these in *Trochus* and *Cerithium* especially, though here allied species are not uniformly preserved as aragonite now.

Amongst Lamellibranchs two species from the Middle Lias are preserved as aragonite; five are from the Lower, and one species of each come from the Upper Greensand, Gault, and Thanet Sands respectively.

In the Lower Lias *Nucula*, *Leda*, *Cucullæa*, and *Arca* in the Middle Lias appear to be especially associated with an aragonite inner layer.

Thus, in the main, the contentions advanced by Professor Cole hold good in a second series of observations made by me independently, whilst my original suggestion as to aragonite being still the shell-layer in Middle Lias forms is borne out by additional examples and further strengthened by the abundance of Lower Lias types.

NOTICES OF MEMOIRS.

THE BALUCHISTAN EARTHQUAKE OF 21ST OCTOBER, 1909. By A. M. HERON, B.Sc., F.G.S. Records, Geological Survey of India, vol. xli, pp. 22-35, 1911.

THE earthquake (of intensity 9, Rossi-Forel scale) occurred at about 5.12 a.m., in a district from 40 to 50 miles to the north of Jacobabad, and resulted in the loss of 231 lives and much damage to the villages of Bagh, Bellpat, and Shahpur. As in most strong earthquakes, the onset of the shock was sudden. Mr. Heron traces three isoseismal lines from the evidence of damaged buildings. They

are remarkable for their great elongation from north-west to south-east, the innermost being 57 miles long and only 8 miles wide. The central area is covered by thick alluvial deposits, but it lies in the gigantic festoon of the Marri and Bugti Hills, by which the north and south trend of the Baluchistan ranges is interrupted. Mr. Heron considers that the earthquake was probably caused by a movement along a reversed fault, although no trace of deep-seated displacement is visible at the surface. C. D.

REVIEWS.

I.—GEOLOGY OF THOUARS.

LA GÉOLOGIE DES ENVIRONS DE THOUARS (DEUX-SÈVRES) ET L'ÉTAGE TOARCEN. By Professor JULES WELSCH, of the University, Poitiers. Mém. Soc. des Sc. Nat. des Deux-Sèvres, 1911.

THE rocks of this district include, as a foundation, Pre-Cambrian schists and granitic rocks, and then Toarcian, Bajocian, Bathonian, Callovian, Cenomanian, Turonian, and various Quaternary deposits. Attention is directed especially to the Toarcian of Thouars or *Toarciùm*, where the classic section as seen in the quarries at Vrines shows in downward succession: Plateau deposits (1½ metres), Cenomanian (½ metre), Toarcian (conglomerate and grit, blue marls, ferruginous oolites, yellow marls and limestones, about 10 metres), Pre-Cambrian (schists and slates).

The Toarcian strata (as originally grouped by d'Orbigny) are divided into the following zones or palæontological horizons by Professor Welsch:—

- Ammonites opalinus* (with *Rhynchonella cynocephala*, *Terebratula infra-oolithica*, etc.).
- A. aalensis* (with *Dumortieria Moorei*, etc.).
- A. radians* (with *Catulloceras dumortieri*, etc.).
- A. insignis* (with *Grammoceras fallaciosum*, etc.).
- A. toarcensis* (with *G. cf. striatulum*, etc.).
- A. variabilis* (with *Lytoceras sublineatum*, etc.).
- A. bifrons* (with *Dactyloceras holandrei*, etc.).
- A. falcifer* (with *D. annulatum*, etc.).

The conglomerate and grit (1 to 3 metres thick) which rests irregularly on the Pre-Cambrian was at one time grouped with the Middle Lias, but Professor Welsch, after prolonged research, found in the strata an ammonite near to *Harpoceras Strangewayisi*, and he groups the beds with overlying layers in the zone of *Ammonites falcifer*.

He remarks that there is a gradual passage from one zone to another in the Toarcian of Thouars, and that the type of the stage has been well chosen in the quarries of Vrines-Thouars, where there occur neither the Ammonites of the Middle Lias nor those of the Bajocian.

After commenting on the Aalenian division of Mayer-Eymar, Professor Welsch observes that there are affinities between the beds with *Lioceras opalinum* and those with *Ludwigia Murchisonæ*, while again it is difficult to separate the higher zonal stages in the Bajocian, the divisions being arbitrary and local.
